

# SN54154, SN74154 4-LINE TO 16-LINE DECODERS/DEMULTIPLEXERS

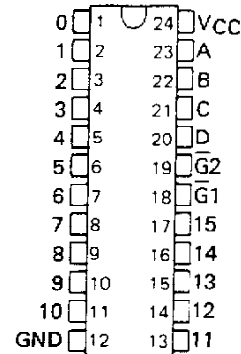
SDLS056

DECEMBER 1972 — REVISED MARCH 88

- '154 is Ideal for High-Performance Memory Decoding
- Decodes 4 Binary-Coded Inputs into One of 16 Mutually Exclusive Outputs
- Performs the Demultiplexing Function by Distributing Data From One Input Line to Any One of 16 Outputs
- Input Clamping Diodes Simplify System Design
- High Fan-Out, Low-Impedance, Totem-Pole Outputs
- Fully Compatible with Most TTL and MSI Circuits

SN54154 . . . J OR W PACKAGE  
SN74154 . . . N PACKAGE

(TOP VIEW)



TYPICAL AVERAGE PROPAGATION DELAY 3 LEVELS OF LOGIC		TYPICAL POWER DISSIPATION
23 ns	19 ns	170 mW

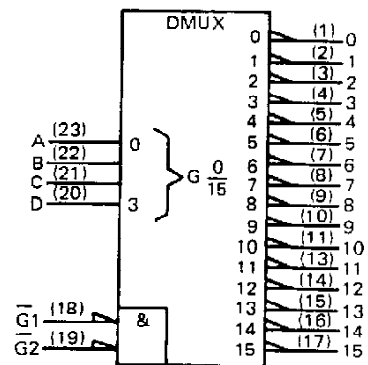
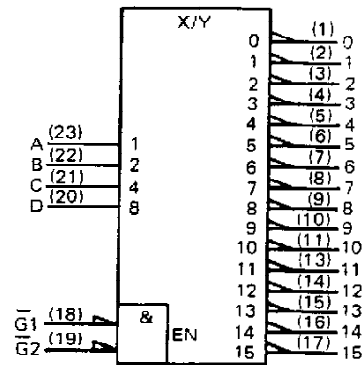
logic symbols (alternatives)<sup>†</sup>

### description

Each of these monolithic, 4-line-to-16-line decoders utilizes TTL circuitry to decode four binary-coded inputs into one of sixteen mutually exclusive outputs when both the strobe inputs,  $\overline{G1}$  and  $\overline{G2}$ , are low. The demultiplexing function is performed by using the 4 input lines to address the output line, passing data from one of the strobe inputs with the other strobe input low. When either strobe input is high, all outputs are high. These demultiplexers are ideally suited for implementing high-performance memory decoders. For ultra-high speed systems, SN54S138/SN74S138 and SN54S139/SN74S139 are recommended.

These circuits are fully compatible for use with most other TTL circuits. All inputs are buffered and input clamping diodes are provided to minimize transmission-line effects and thereby simplify system design.

The SN54154 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74154 is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .



<sup>†</sup>These symbols are in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS  
INSTRUMENTS**

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

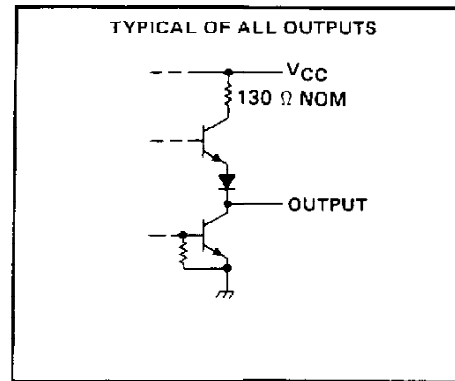
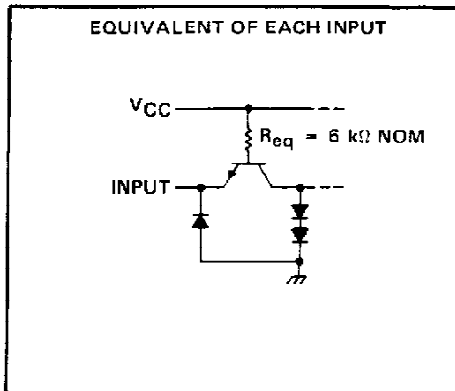
# SN54154, SN74154 4-LINE TO 16-LINE DECODERS/DEMULTIPLEXERS

FUNCTION TABLE

G1		G2		INPUTS				OUTPUTS															
D	C	B	A	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				
L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H				
L	L	L	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H				
L	L	L	H	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H				
L	L	L	H	H	H	L	H	L	H	H	H	H	H	H	H	H	H	H	H				
L	L	L	H	L	H	H	L	H	L	H	H	H	H	H	H	H	H	H	H				
L	L	L	H	H	L	H	H	L	H	H	H	H	H	H	H	H	H	H	H				
L	L	L	H	H	H	L	H	H	L	H	H	H	H	H	H	H	H	H	H				
L	L	L	H	H	H	H	L	H	H	L	H	H	H	H	H	H	H	H	H				
L	L	H	L	L	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H				
L	L	H	L	H	L	H	H	H	H	H	H	H	L	H	H	H	H	H	H				
L	L	H	L	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H	H				
L	L	H	H	L	L	H	H	H	H	H	H	H	H	L	H	H	H	H	H				
L	L	H	H	L	H	H	H	H	H	H	H	H	H	L	H	H	H	H	H				
L	L	H	H	H	L	H	H	H	H	H	H	H	H	H	L	H	H	H	H				
L	L	H	H	H	H	L	H	H	H	H	H	H	H	H	H	L	H	H	H				
L	L	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H	L	H	H				
L	L	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H				
L	H	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H				
H	L	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H				
H	H	X	X	X	X	H	H	H	H	H	H	H	H	H	H	H	H	H	H				

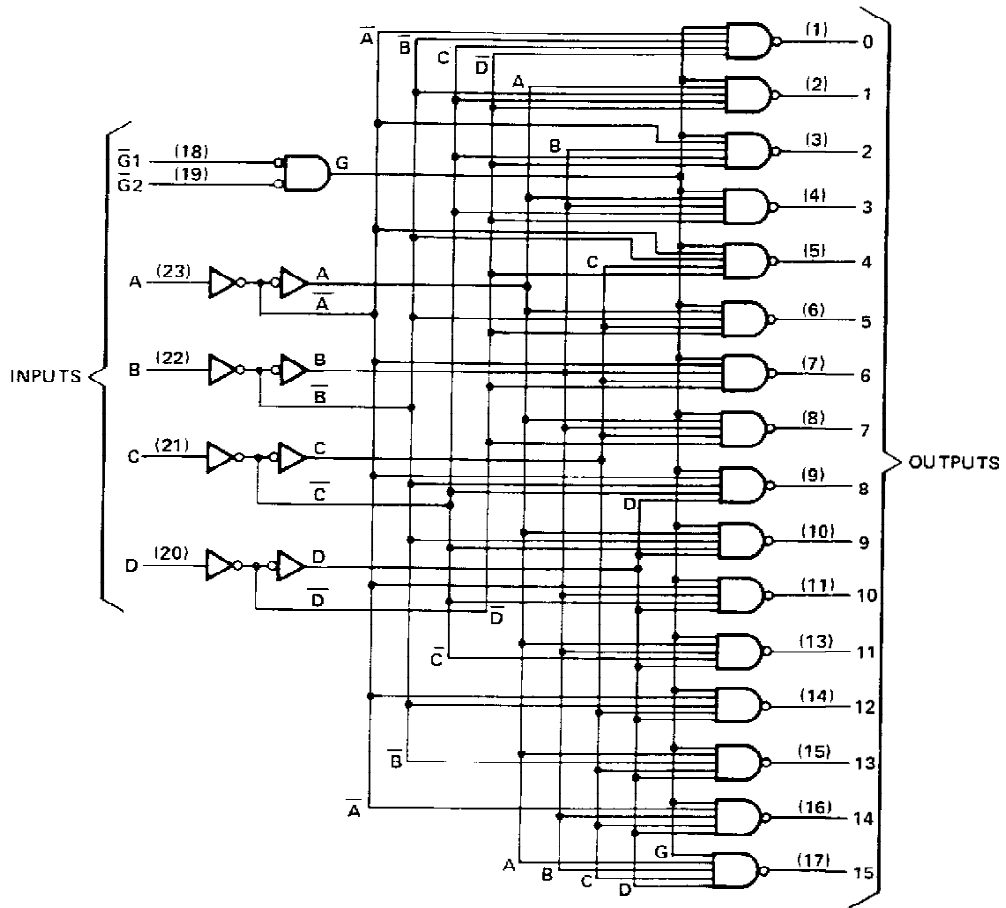
H = high level, L = low level, X = Irrelevant

## schematics of inputs and outputs



SN54154, SN74154  
4-LINE TO 16-LINE DECODERS/DEMULTEPEXERS

logic diagram (positive logic)



TEXAS  
INSTRUMENTS

POST OFFICE BOX 6550 • DALLAS, TEXAS 75268

# SN54154, SN74154

## 4-LINE TO 16-LINE DECODERS/DEMULTIPLEXERS

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage	5.5 V
Operating free-air temperature range: SN54154 Circuits	-55°C to 125°C
SN74154 Circuits	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

	SN54154			SN74154			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, $V_{CC}$	4.5	5	5.5	4.75	5	5.25	V
High-level output current, $I_{OH}$			-800			-800	$\mu$ A
Low-level output current, $I_{OL}$			16			16	mA
Operating free-air temperature, $T_A$	-55		125	0		70	C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	SN54154			SN74154			UNIT
		MIN	TYP	MAX	MIN	TYP‡	MAX	
$V_{IH}$ High-level input voltage		2			2			V
$V_{IL}$ Low-level input voltage				0.8			0.8	V
$V_{IK}$ Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$			-1.5			-1.5	V
$V_{OH}$ High-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OH} = -800 \mu\text{A}$	2.4	3.4		2.4	3.4		V
$V_{OL}$ Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OL} = 16 \text{ mA}$		0.2	0.4		0.2	0.4	V
$I_I$ Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$			1			1	mA
$I_{IH}$ High-level input current	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$			40			40	$\mu$ A
$I_{IL}$ Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			-1.6			-1.6	mA
$I_{OS}$ Short-circuit output current‡	$V_{CC} = \text{MAX}$	-20		-55	-18		-57	mA
$I_{CC}$ Supply current	$V_{CC} = \text{MAX}$ , See Note 2		34	49		34	56	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.

‡ All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}$ .

§ Not more than one output should be shorted at a time.

NOTE 2:  $I_{CC}$  is measured with all inputs grounded and all outputs open.

switching characteristics,  $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{PLH}$ Propagation delay time, low-to-high-level output, from A, B, C, or D inputs through 3 levels of logic	$C_L = 15 \text{ pF}, R_L = 400 \Omega,$ See Note 3		24	36	ns
$t_{PHL}$ Propagation delay time, high-to-low-level output, from A, B, C, or D inputs through 3 levels of logic			22	33	ns
$t_{PLH}$ Propagation delay time, low-to-high-level output, from either strobe input			20	30	ns
$t_{PHL}$ Propagation delay time, high-to-low-level output, from either strobe input			18	27	ns

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

TEXAS  
INSTRUMENTS

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

## IMPORTANT NOTICE

Texas Instruments (TI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

TI warrants performance of its semiconductor products and related software to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Certain applications using semiconductor products may involve potential risks of death, personal injury, or severe property or environmental damage ("Critical Applications").

TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS.

Inclusion of TI products in such applications is understood to be fully at the risk of the customer. Use of TI products in such applications requires the written approval of an appropriate TI officer. Questions concerning potential risk applications should be directed to TI through a local SC sales office.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards should be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor does TI warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used.

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
5962-9558101QJA	ACTIVE	CDIP	J	24	1	TBD	Call TI	Level-NC-NC-NC
5962-9558101QKA	ACTIVE	CFP	W	24	1	TBD	Call TI	Level-NC-NC-NC
5962-9558101QKA	ACTIVE	CFP	W	24	1	TBD	Call TI	Level-NC-NC-NC
SN54154J	ACTIVE	CDIP	J	24	1	TBD	Call TI	Level-NC-NC-NC
SN54154J	ACTIVE	CDIP	J	24	1	TBD	Call TI	Level-NC-NC-NC
SN74154DW	OBSOLETE	SOIC	DW	24		TBD	Call TI	Call TI
SN74154DW	OBSOLETE	SOIC	DW	24		TBD	Call TI	Call TI
SN74154N	ACTIVE	PDIP	N	24	15	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74154N	ACTIVE	PDIP	N	24	15	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74154N3	OBSOLETE	PDIP	N	24		TBD	Call TI	Call TI
SN74154N3	OBSOLETE	PDIP	N	24		TBD	Call TI	Call TI
SNJ54154J	ACTIVE	CDIP	J	24	1	TBD	Call TI	Level-NC-NC-NC
SNJ54154J	ACTIVE	CDIP	J	24	1	TBD	Call TI	Level-NC-NC-NC
SNJ54154W	ACTIVE	CFP	W	24	1	TBD	Call TI	Level-NC-NC-NC
SNJ54154W	ACTIVE	CFP	W	24	1	TBD	Call TI	Level-NC-NC-NC

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

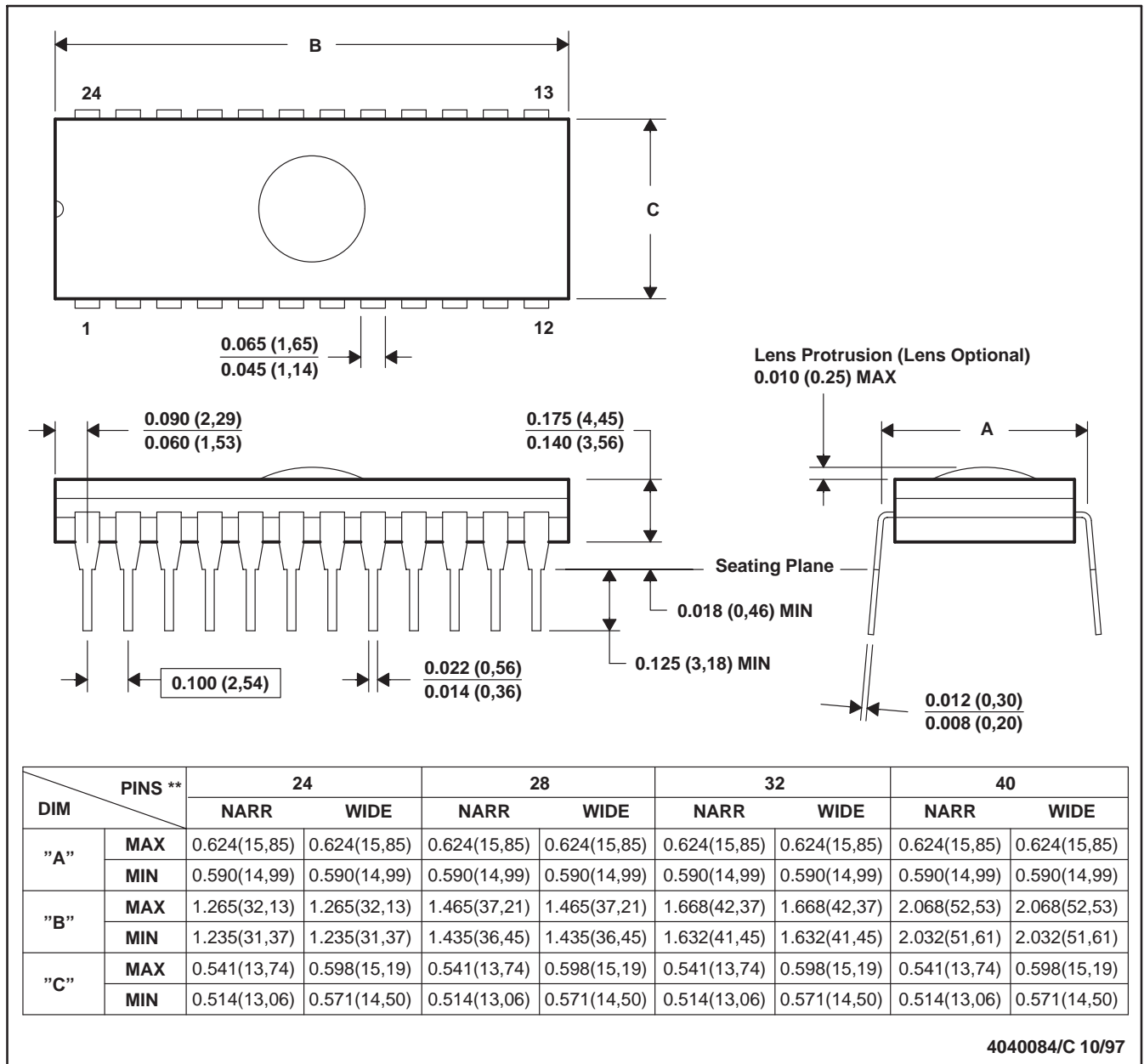
**Important Information and Disclaimer:**The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

J (R-GDIP-T\*\*)

CERAMIC DUAL-IN-LINE PACKAGE

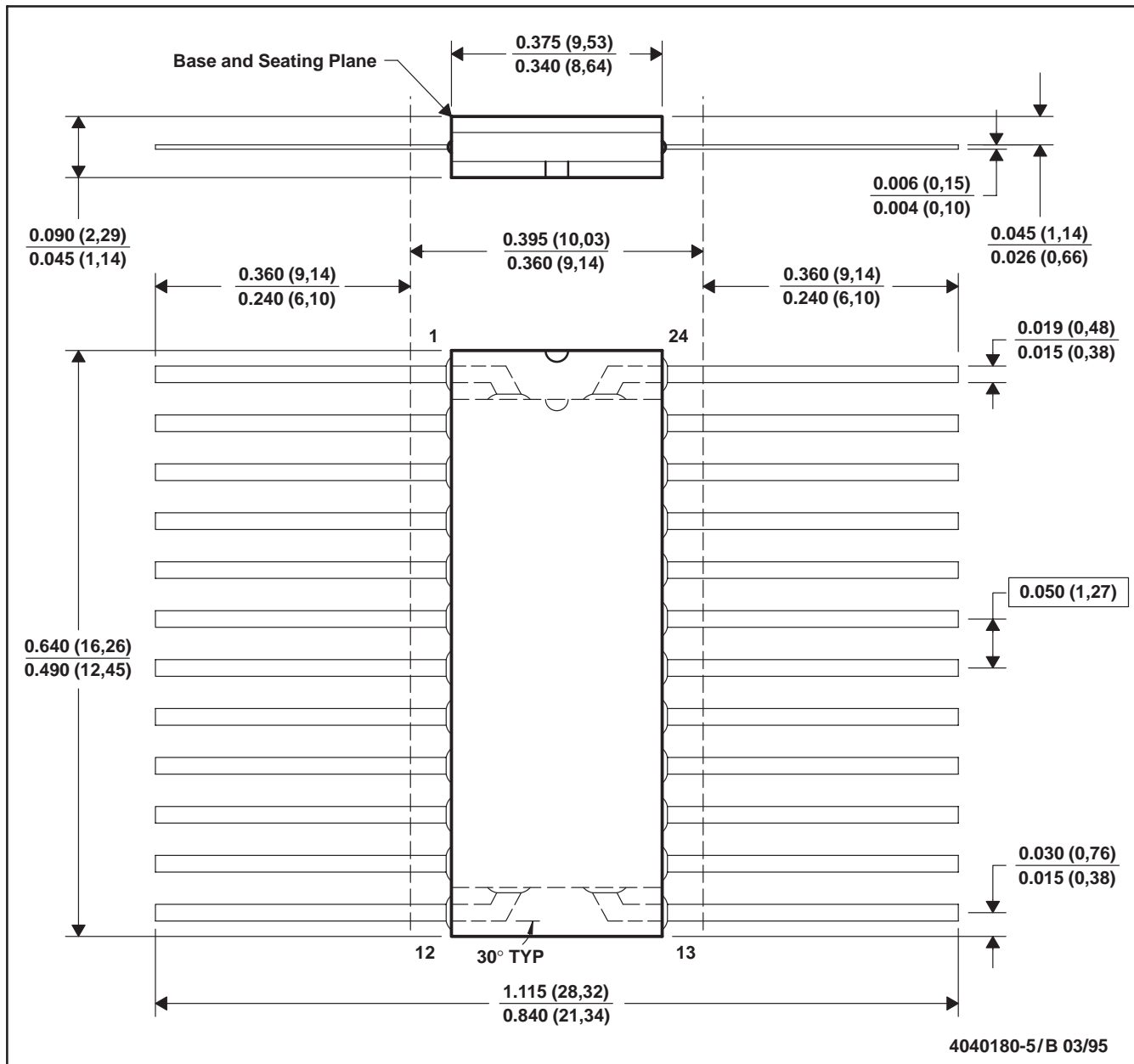
24 PINS SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. Window (lens) added to this group of packages (24-, 28-, 32-, 40-pin).  
 D. This package can be hermetically sealed with a ceramic lid using glass frit.  
 E. Index point is provided on cap for terminal identification.

W (R-GDFP-F24)

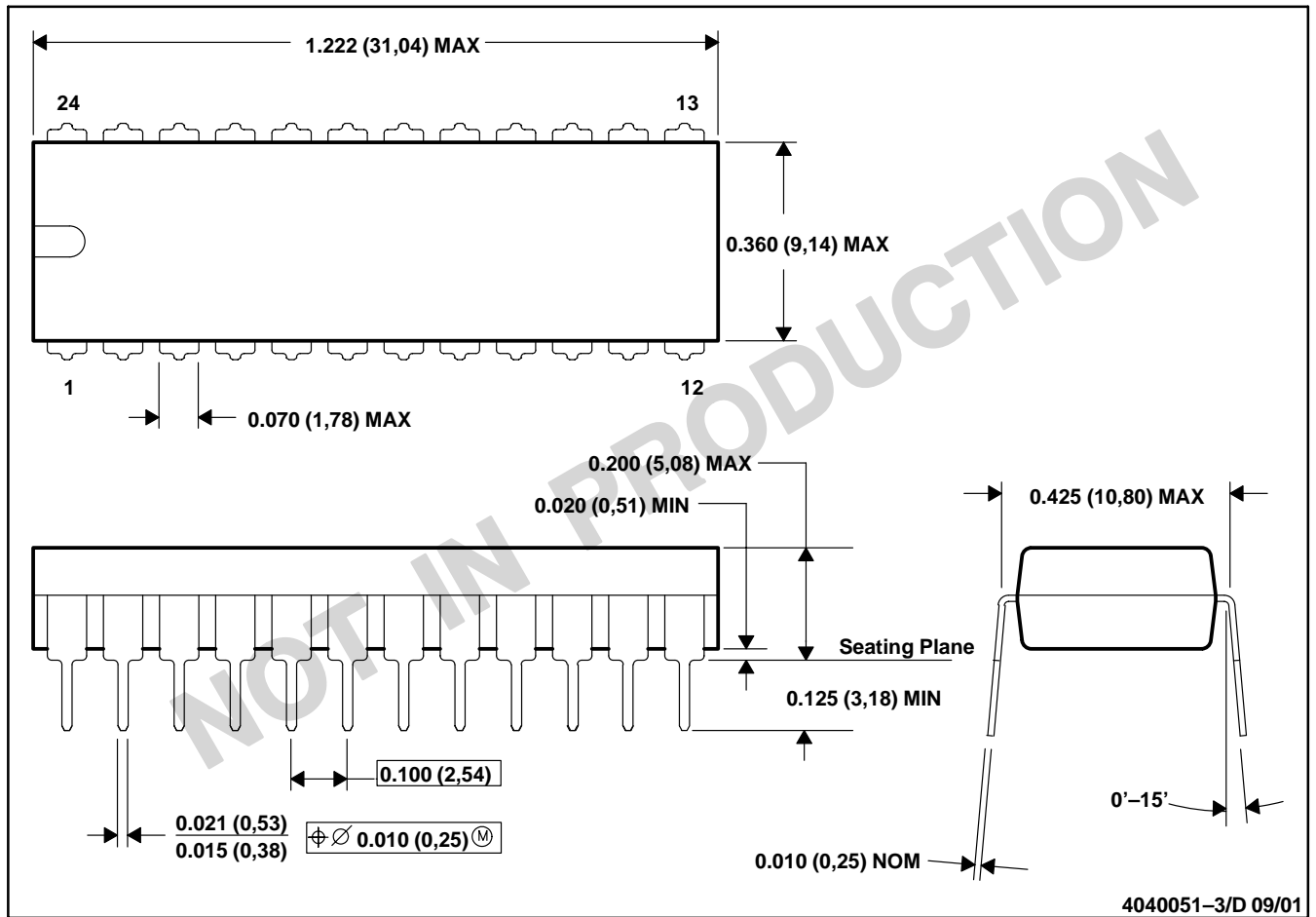
CERAMIC DUAL FLATPACK



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Falls within MIL-STD-1835 GDFP2-F24 and JEDEC MO-070AD
  - E. Index point is provided on cap for terminal identification only.

N (R-PDIP-T24)

PLASTIC DUAL-IN-LINE

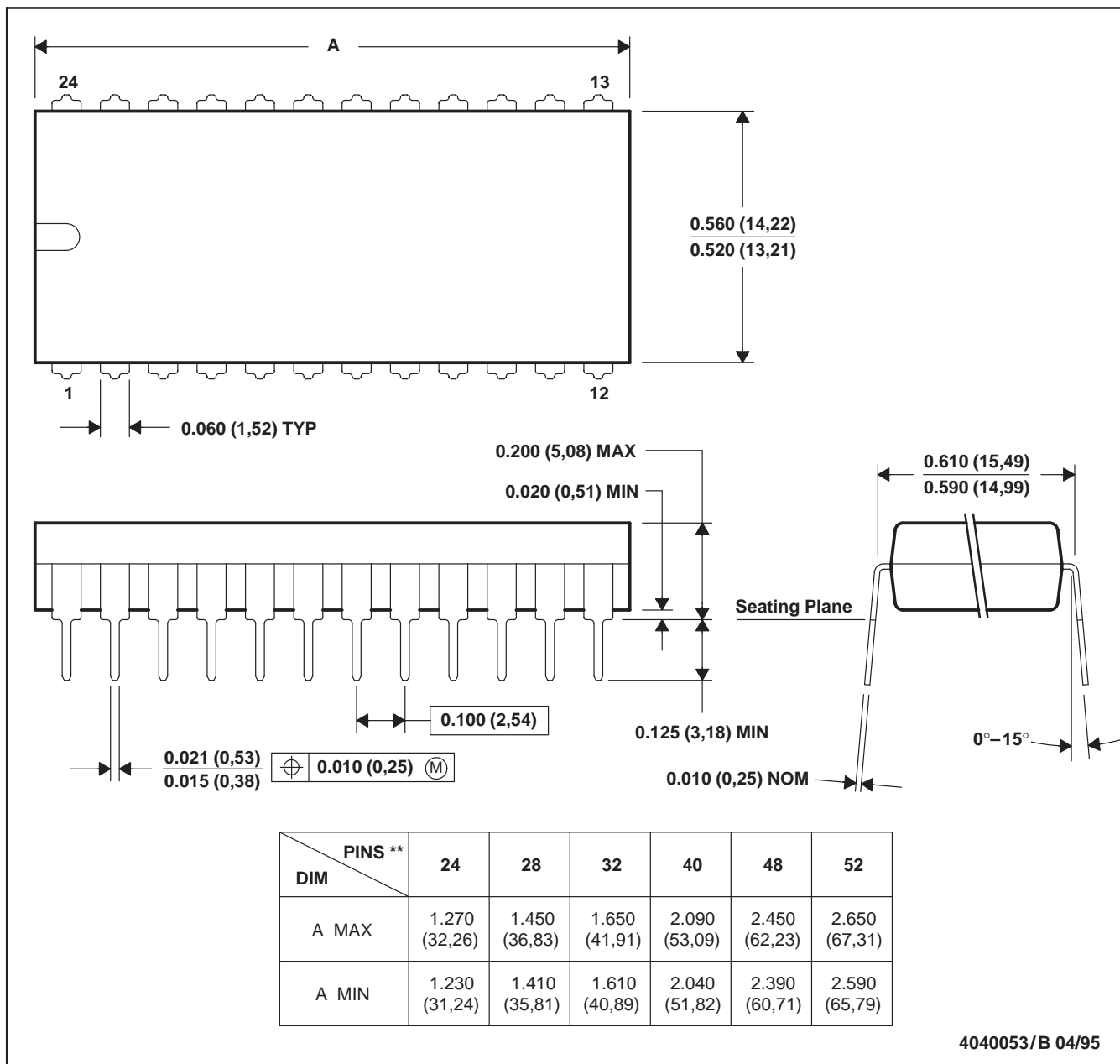


- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. Falls within JEDEC MS-010

**N (R-PDIP-T\*\*)**

**PLASTIC DUAL-IN-LINE PACKAGE**

24 PIN SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. Falls within JEDEC MS-011  
 D. Falls within JEDEC MS-015 (32 pin only)



## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

<b>Products</b>		<b>Applications</b>	
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>	Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>	Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>	Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>	Digital Control	<a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>	Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>	Optical Networking	<a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>	Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
		Telephony	<a href="http://www.ti.com/telephony">www.ti.com/telephony</a>
		Video & Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
		Wireless	<a href="http://www.ti.com/wireless">www.ti.com/wireless</a>

Mailing Address: Texas Instruments  
Post Office Box 655303 Dallas, Texas 75265